Easy-To-Use Bioassay Spots *Varroa* Resistance

Varroa mites are devastating honey bee parasites that require chemical controls. Since being detected in Florida in the mid-1980s, the mites have firmly entrenched themselves in hives across the country, sorely testing the honey bee's pollination of 100-plus kinds of flowering crops.

Now, state bee inspectors and commercial apiarists have a fast, new way to check *Varroa* mites for resistance to coumaphos, one of the chemicals used to rid hives of these blood-sucking parasites.

Entomologist Jeffery S. Pettis and colleagues at ARS's Bee Research Laboratory, in Beltsville, Maryland, devised a do-it-yourself bioassay that determines, within 6 hours, whether a hive's mite population is fully resistant, approaching resistance, or still vulnerable to chemical treatment.

Current methods are labor-intensive affairs performed by laboratory technicians using specialized equipment, says Pettis, whose bioassay approach will appear in the *American Bee Journal*.

STEPHEN AUSMUS (K11145-2)

***Varroa* mites are a major threat to honey bee health and are becoming resistant to two compounds (coumaphos and fluvalinate) used to control them. Beekeepers now have a simple assay to determine whether mites are resistant and thus ensure use of appropriate control measures.**

"Bioassays enable beekeepers to check mite populations before treatment, saving money on control compounds if mites are resistant," he says.

Pettis based the bioassay on one that he and ARS entomologists Mark F. Feldlaufer and Hachiro Shimanuki (now retired) designed in 1998 to detect mites resistant to fluvalinate, another compound used to control mite infestations. "The bioassay is intentionally low tech," says Pettis. "I wanted something that was user friendly and didn't require specimen shipping or specialized equipment."

The bioassay involves collecting two groups of bees with mites and ushering them into glass canning jars capped with fine-mesh lids. Other materials include index cards that hold strips treated with either coumaphos or fluvalinate. By using two samples of bees, the beekeeper can test for resistance to both compounds simultaneously.

Bees are exposed to the test strips for 6 hours. Then, the jars are inverted and gently tapped to cause dead mites to fall out onto a light-colored surface, where they can be counted. The beekeeper counts any surviving mites by washing them off of the bees in the jar.

Next, the percentage of mites killed by the treatments is calculated. "Mite kills below 50 percent indicate approaching resistance," Pettis says. "Kills below 25 percent generally indicate full resistance."

Pettis verified the bioassay's reliability at commercial apiaries in Maine and Florida and on hives at ARS's Beltsville bee lab.

Mite resistance prompted by continuous use of coumaphos and fluvalinate, Pettis notes, "is forcing beekeepers to adopt integrated pest-management approaches, using selective stocks of honey bees resistant to the mite, other chemicals like formic acid and thymol, and rotation—alternating between coumaphos and fluvalinate."

In some states, Pettis reports, bee inspectors have used the bioassay results to apply for emergency-use exemptions from the U.S. Environmental Protection Agency, which requires documented mite resistance before allowing use of alternative control products.

State inspectors are also using the bioassay to conduct mite surveillance. Says Pettis: "Inspectors want to have a handle on where mite resistance is spreading within a state to give beekeepers a heads-up."—By **Jan Suszkiw,** ARS.

This research is part of Crop Production and Protection, an ARS National Program (#305) described on the World Wide Web at www.nps.ars.usda.gov.

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